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(54) Envelope forming machine.

(57) An envelope forming machine, in particular paper and paperboard envelopes, comprising opposite punches (2) with rotating blades (5), equipped with circumferential and synchronizing regulating devices; fixed formers-conveyors (29) comprising a flat central body (30), with curved side profiles (31) with progressive variable flow; pressure rollers (36) and cutters with movable transversal blade (39) coupled to a fixed transversal blade (37).

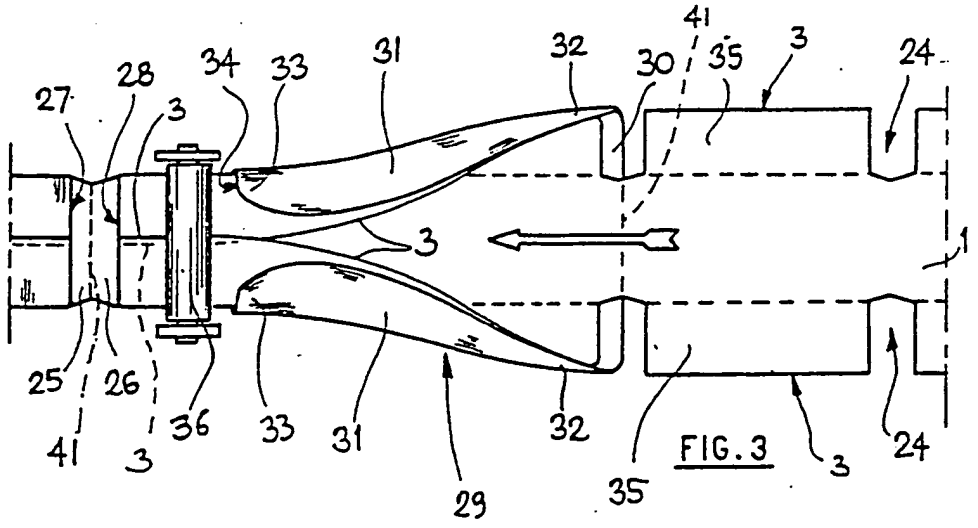

FIG. 3

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ENVELOPE FORMING MACHINE

The present invention refers to an envelope forming machine. In particular, it refers to a machine for the formation of paper and/or paperboard envelopes.

As known, a production line for the formation of envelopes comprises: an unwinder of the continuous tape or paper coil; a possible printing and/or gumming unit; a gummer and perforator or cutter of the closures; an envelope forming means; a means of detachment and closing of the bottoms and a table or tables to collect the finished products.

The object of the present invention is to make some modifications and improvements to the known production lines in order to simplify the processing cycle, improve the products, accelerate the preparation and maintenance phases of the machinery and reduce the number of accessories and means necessary for different productions.

In fact, in the present envelope production lines, there are some operating phases in which the mechanical devices are not capable of carrying out in totally correct or simple, fast and economic manner the action for which they were designed and used. In particular, the ends of the envelopes are punched with means that do not guarantee a continuous feed of the paper tape and create some signs which, in the subsequent phases of gumming and closing of the bottoms, form four superimposed layers of paper.

These layers are the cause of a useless waste of material and higher energy consumption for the punching and sequential tearing phases. The perforated punches must also be interchangeable to suit the type and/or size of the envelopes to be formed, and are fairly difficult and lengthy to replace, to the detriment of production.

Another problem consists in the fact that the envelopes forming phases, i.e. the phases in which the edges are folded in the center and glued together, are obtained by means of pairs of lateral fixed wheels and accompanying rollers with forming plates. While substantially functional, these devices are numerous, substantially complicate the structure of the machinery and require considerable maintenance, both for regular operation and/or for positioning to suit the type and/or size of envelope to be prepared.

Another problem consists in the fact that the preformed envelopes are separated by tearing which detaches them along the lines perforated in previous punching phases. This tearing, besides requiring a notable energy absorption, is obtained by means of fairly complex, and on the whole expensive, devices. Tearing also causes an undesired formation of paper dust, which, through time, dirties the whole machine and surrounding areas and makes the surrounding air unhealthy and unbreathable. The object of the present invention is to eliminate the above problems.

According to the present invention, this and other objects which will result from the following description are obtained by means of a machine for the formation of paper and/or paperboard envelopes comprising opposite punches with rotating blades with circumferential regulating and synchronizing devices; fixed forming-conveying means comprising a flat central body with curved side profiles with progressive variable flow, and cutters comprising a movable transversal blade coupled to a fixed transversal blade.

With the machine of the present invention, the punching phase is obtained by means of the pair of opposite blades, adjustable and rotating, along the sides of the continuous paper tape arriving from the unwinder. During this phase only the side profiles forming the end edges of the envelopes and the closing flaps are formed. Punching takes place by means of rotation of said opposite blade at right angles to the flow of paper tape, whose speed remains constant and without oscillations for each type of envelope.

The folding phase of the tubular body, i.e. the formation of the body of the envelope, which follows punching, is obtained by means of a forming profile in which the continuous paper tape, punched, folds its sides naturally, connecting them and overlapping the longitudinal pregummed flaps. Said longitudinal flaps are stuck together by a central pressing roller, all at continuous speed.

The tubular body obtained is divided into envelopes by a straight cutting separator consisting of an adjustable rotating transversal blade, whose action is synchronized with the continuous feed of said tubular body.

The advantages of the envelope forming machine, according to the present invention, mainly consists in the fact that the envelope forming cycle substantially takes place at constant speed, without any intermittence and oscillation. The punchings and subsequent operations are obtained with net, precise cuts, in perfect synchronization with the continuous feed of the paper tape, without producing dust, with reduced power absorption, and more silently than in the present systems.

Moreover, paper consumptions are reduced; in fact, no undesired layers of paper are formed, only that necessary to close the longitudinal flaps to form the tubular body. With a single punch cut both the flap closing the bottom of the envelopes

and the upper flap are formed. Further advantages consist in the fact that punch cutters are interchangeable and can be used for different envelope sizes. They are accurately positioned by a simple circumferential regulation, without dismantling anything, quickly and accurately, unlike the present punches which must be totally replaced,with decidedly long positioning and tuning times.

The constructive and functional characteristics of the envelope forming machine of the present invention will be better under stood from the following detailed description in which reference is made to the attached drawings which show a preferred, illustrative but unbinding version of the present invention, in which:

Fig. 1 is the plan of the continuous paper tape during the punching phase;

Fig. 2 is a detail of the schematic view in plan of a punch head with angular regulation;

fig. 3 is the schematic view in plan of a forming profile for the folding of continuous tape;

Fig. 4 is the view in plan of an envelope obtained with the machine of the present invention.

With reference to the figures, the continuous paper tapes (1), coming from any unwinding means coupled to longitudinal gumming units and possibly to transversal gumming units of the flaps and heading units, are fed, with known means, to the punching station. This station comprises two operating heads (2) positioned one in front of the other, in alignment, and aligned with the opposite sides (3) of the continuous tapes, with respect to the sides of which they take up a substantially right-angled position.

Each operating head (2) comprises a rotating drum (4) equipped with a tangential support (4′) on which an interchangeable blade (5) is fixed, whose axial position can be easily adjusted with lock nuts (6) operating in longitudinal slits (7) obtained in said support (4′).

The above regulation consents the use of the same blades (5) for the punching of envelopes (8) of different sizes. For large size differences, for special bags or for periodic sharpening, the blades (5) may be easily and quickly replaced, keeping the dead times of replacement and maintenance within very narrow limits.

Each rotating drum (4) is supported at the sides by bearings (9) and comprises an elongated, grooved end (10) which is coupled with a sprocket with helical toothing (11) equipped with an end thrust bearing (12). The helical sprocket (11) is engaged in a helical gearing (13) coaxial with a conical pinion (14). Said conical pinion (14) receives the rotating movement from other members, not illustrated, as they form part of the known technique.

The end thrust bearing (12), coupled to the helical sprocket (11), is engaged between two idle rollers (15). The rotation axes of said rollers (15) are integral with supports (16), fixed to a body (17) which can slide, guided by at least one tang or longitudinal key (18), along a fixed pin (19). The fixed pin (19) is fixed to the supporting structure (20) of the operating head (2).

The slip of the body (17) along the fixed pin (19) is obtained by means of the knob (21) which, rotating, engages its threaded end (22) in a corresponding threaded hole (23), coaxial to the pin (19).

The rotation of the knob (21), in one of the two directions, induces transversal displacements of the sprocket (11) along the grooved end (10).

Thanks to the helical shape of the toothing of the sprocket (11), which slides into the helical one of the gearing (13), each transversal displacement along the grooved end (13) causes a corresponding rotation of the sprocket (11) in circumferential direction.

Said circumferential displacements consent precise position recordings of each drum (4), carrying blade (5), with respect to the position of the opposite drum (4).

With the regulation of the drums (4) mounted on the two opposite heads (2), the rotation of the opposite blades (5) is perfectly synchronized, with consequent simultaneous action on the continuous paper tapes (1) and correct, accurate punching of the profiles (24) which produce, in subsequent phases, the rear (25) and front (26) closing flaps, and the rear (27) and front (28) edges of the envelope.

The abovementioned synchronism of the blades (5) and a suitable rotating speed of the rollers (4) make it possible to obtain the punching of profiles (24) while the continuous paper tape (1) moves forward at constant, continuous speed. To produce bags of different length, at equal rotating speed of the rollers (4), the feed speed of the continuous paper tapes is increased or decreased.

This is obtained by replacing the pair of differential gears which transmit motion from the motors to the rollers, or by applying a speed gearshift, e.g. the Norton gearshift or similar.

After the punching of the profiles (24), the continuous tape (1) continues its travel and passes to the subsequent tubular body forming station, i.e. station to form the central closed part of the envelope.

The tape (1), towed, is inserted in a fixed interchangeable conveyor (29). Said conveyor consists of a flat central body (30) equipped with two curved side profiles (31), with progressive variable flow from the entrance point (32) of the tape and the exit point (33). Said profiles (31) assume, in the

exit point (33), a completely folded shape in substantially parallel position, above the flat central body (30), and form with said central body (30) a slit (34) of identical thickness and width to those of the tubular body of the envelopes in formation. During travel of the tape (1), the side flaps (35), comprised between two adjoining punchings (24), slide into the inner surfaces of said curved side profiles (31), fold back and are surmounted by a thickness corresponding to the layer of gum spread on one of the sides (3), before punching and after the known conventional procedures.

At the exit of the slit (34), the tubular body has taken up its final conformation and a pressing roller (36) presses the surmounted edges (3) of the flaps (35) to make them perfectly adherent.

At this stage, the continuous tape (1) is substantially formed by a sequence of tubular bodies delimited by the rear (27) and front (28) edges, intercalated by intermediate flat zones, laterally profiled.

In succession, the continuous tape is passed into a cutting station. Said station comprises a fixed lower transversal blade (37), equipped with means of regulation (38), and an upper transversal blade (39), with means of regulation (42), applied to a rotating roller (40).

The rotating speed of the roller (40) is such that, each time the cutting edge of the upper movable transversal blade (39) is aligned with and brushes against the cutting edge of the lower fixed transversal blade (37), the continuous tape (1) which slides between them is aligned according to a broken transversal line (41) corresponding to the center line of each punching (24) and indicated in the figure (3).

In the moment of alignment and touch, the upper movable blade (39) cuts with a net stroke, without producing dust or jagged effects, the continuous tape (1) along the abovementioned broken transversal lines (41). The envelopes (8) are thus formed apart from the folding and glueing of the rear flap (25) which is carried out with conventional methods.

The separating cut of the bags, carried out at right angles to same, is made with the rotating direction of the roller (40), movable blade holder (39), equal to the slip direction of the continuous tape (1) and in collaboration with the lower fixed blade (37), also positioned in the direction of the motion of said tape.

The regulation of the blades (37) and (39) makes it possible to make net cuts, without tears, without draggings or formations of dust.

Bags of different lengths are obtained by increasing or decreasing the feed speed of the continuous tape (1), the rotating speed of the roller (40) remaining steady.

Claims

1) Envelope forming machine, in particular paper and/or paperboard envelopes, comprising opposite punches (2) with rotating blades (5) equipped with circumferential regulating and synchronizing devices: fixed formers-conveyors (29) comprising a flat central body (30) with curved side profiles (31) with progressive variable flow; and cutting means comprising a movable transversal blade (39) coupled to a fixed transversal blade (37).

2) Envelope forming machine according to claim 1, characterized by the fact that each punch (2) comprises a rotating drum (4), for support and transversal regulation of the blade (5), with a grooved end (10) on which a sprocket (11) with helical teeth is keyed, engaged in a helical wheel (13) coaxial with a conic pinion (14); said sprocket (11) being equipped with an end thurst bearing (12), guided and axially adjustable by means of idle rollers (15) driven by an external knob (21); each axial displacement of said knob involving a circumferential displacement of the sprocket (11), and a position recording of the drum (4) with respect to the posi-of the opposite drum.

3) Envelope forming machine, according to claim 1 or 2, in which each blade (5) is interchangeable, adjustable in radial and circumferential direction and synchronized with the corresponding blade (5) of the opposite punch head (2).

4) Envelope forming machine according to any of the previous claims, characterized by the fact that the fixed formers-conveyors comprise an interchangeable fixed conveyor (29) composed of a flat central body (30) with curved side profiles (31) with progressive variable flow from the initial (32) and terminal part (33); in the end zone said profiles assume a completely folded conformation in substantially parallel position, above the flat central body (30), and form with said central body (30) a slit (34) of identical thickness and width to the tubular body of the envelope.

5) Envelope forming machine according to claim 4, characterized by the fact that the side edges (35) of the continuous paper tape (1), comprised between the punches (24), slide into the inner surfaces of the curved side profiles (31) of the interchangeable fixed conveyor (29), and assume a folded position with the side edges longitudinally surmounted.

6) Envelope forming machine according to any of the previous claims, characterized by the fact that a pressing roller (36) is placed at the exit, in alignment with the interchangeable fixed conveyor (29).

7) Envelope forming machine according to any of the previous claims, characterized by the fact that the cutters comprise a fixed transversal blade (37), equipped with means of regulation (38), and a movable transversal blade (39) applied to a roller (40) and equipped with means of regulation (42); said blades (37) and (39) being positioned on opposite sides of the continuous paper tape (1) and positioned in such a way as to be substantially touching along the blades.

8) Envelopeforming machine according to claim 7, characterized by the fact that the cutting direction of the movable blade (39) corresponds to that of the fixed blade (37) and to the feed direction of the paper tape (1).

9) Envelope forming machine according to claim 7 or 8, in the rotating speed of the roller (40) is regulated in such a way that, each time the edge of the movable blade (39) is aligned with, or touches, the edge of the fixed blade (37), the continuous tape (1) is aligned according to the transversal line (41) corresponding to the center line of each punching (24).

10) Envelope forming machine according to claim 7, 8 or 9, in which the fixed (37) and movable blades (39) are adjustable and interchangeable.

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EUROPEAN SEARCH REPORT

Application number

EP 89111105.6

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	DE - A1 - 3 337 199 (CHAPMAN ENVELOPES LTD.) * Totality * --	1-3	B 31 B 1/16 B 31 B 23/14
A	DE - B - 1 185 045 (MARIUS BERGHGRACHT) * Totality * --	1,4-6	
A	US - A - 4 359 919 (FUCHS et al.) * Totality * ----	1,7,8	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 31 B 23/00
B 31 B 1/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	01-09-1989	PFAHLER

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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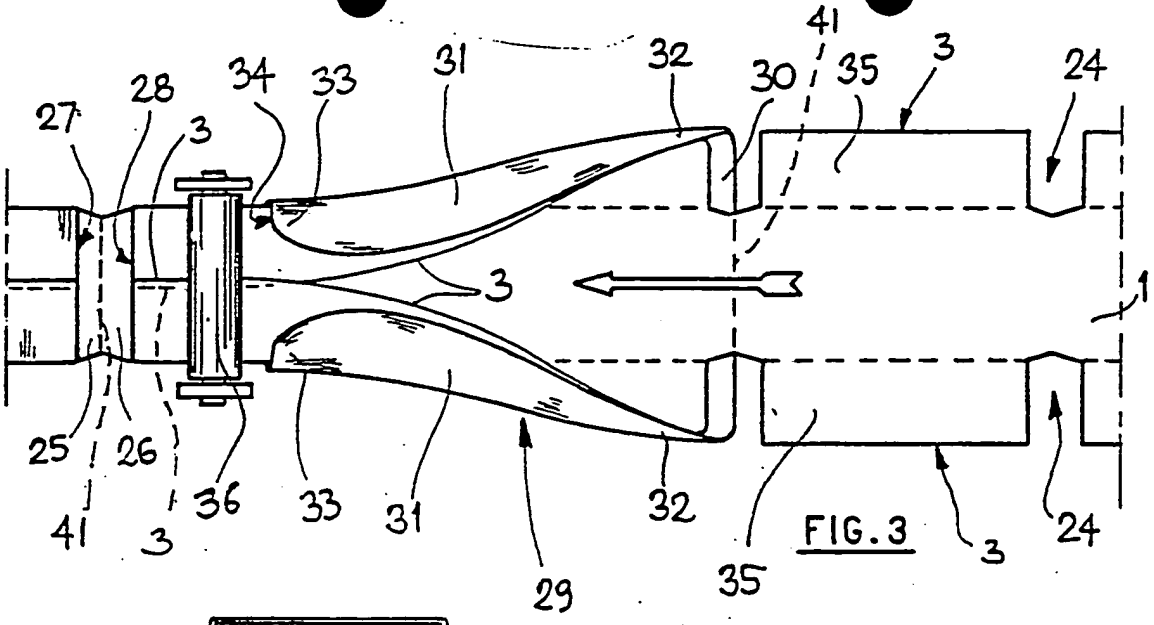

FIG.3

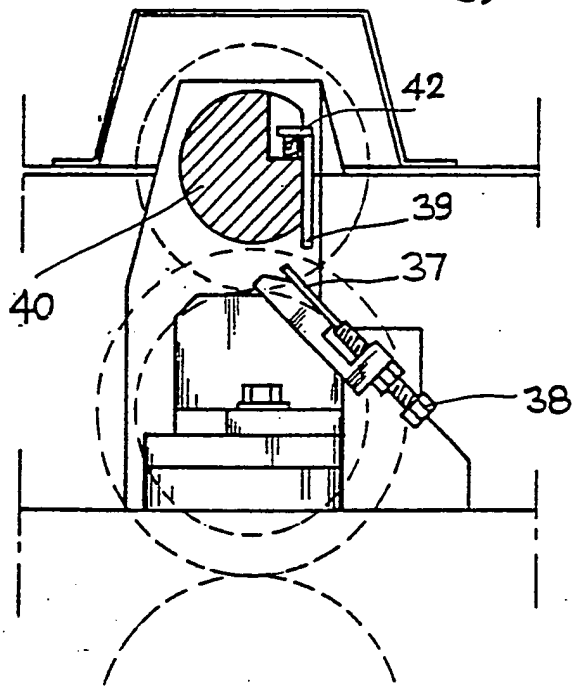

FIG.4

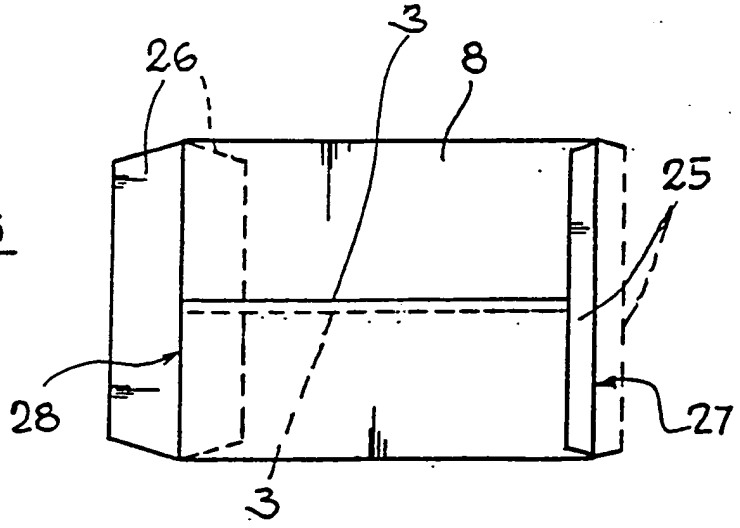

FIG.5

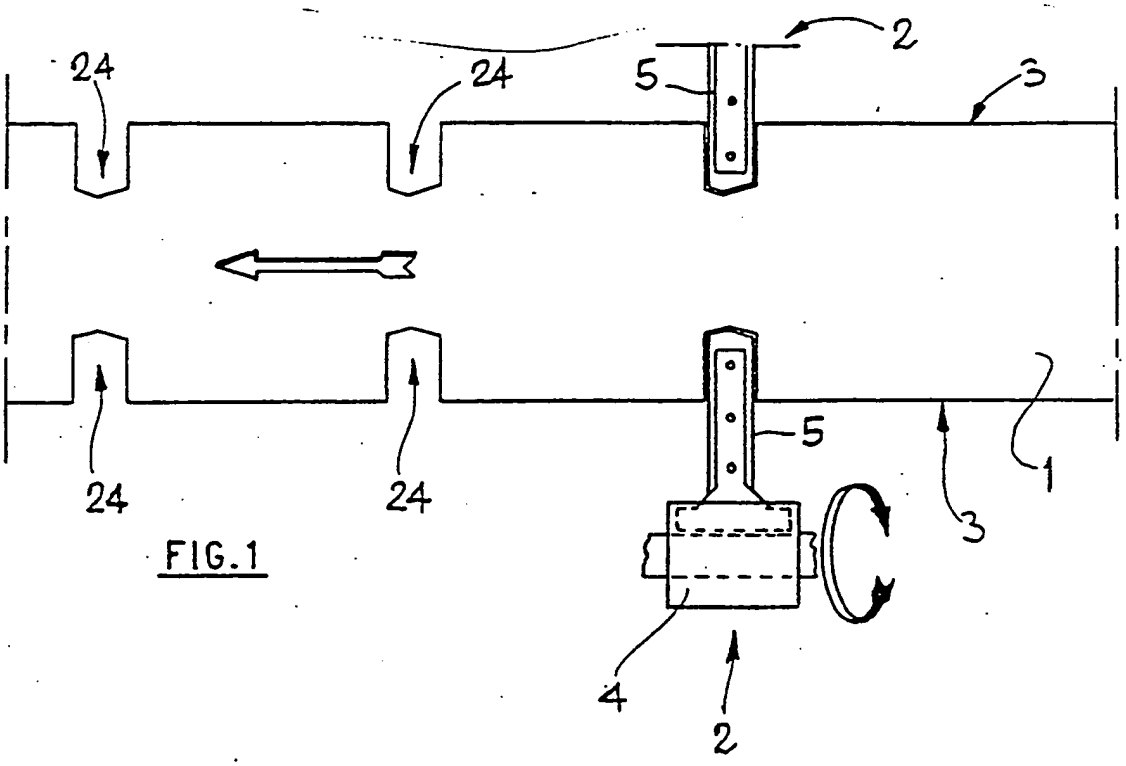
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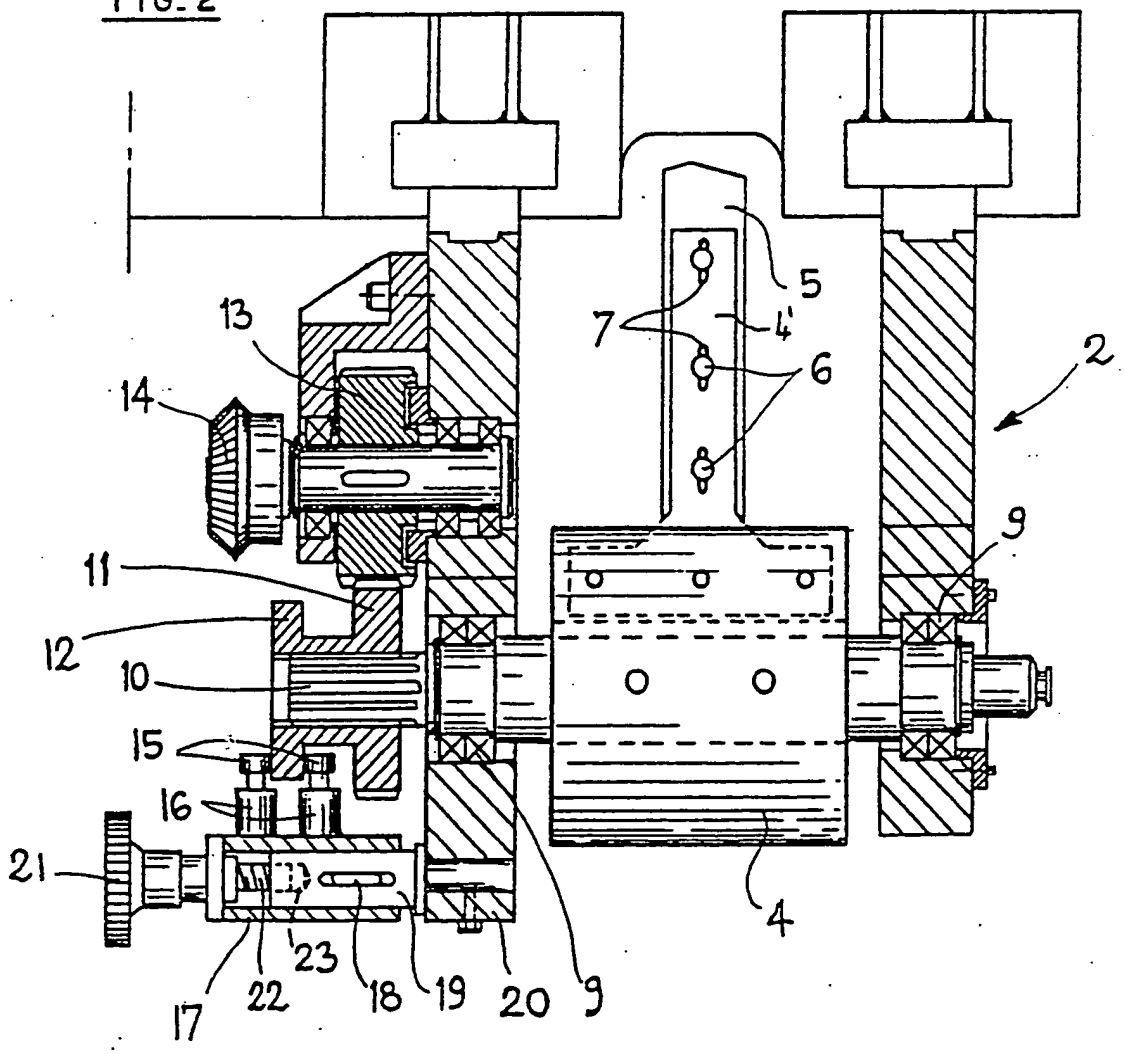
FIG.1

FIG.2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